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Volume 1

February, 1931

Number 1

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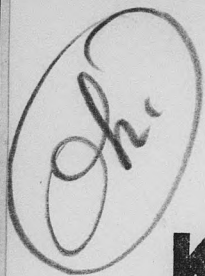
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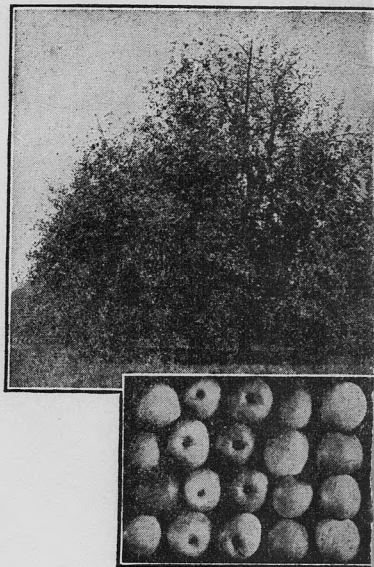
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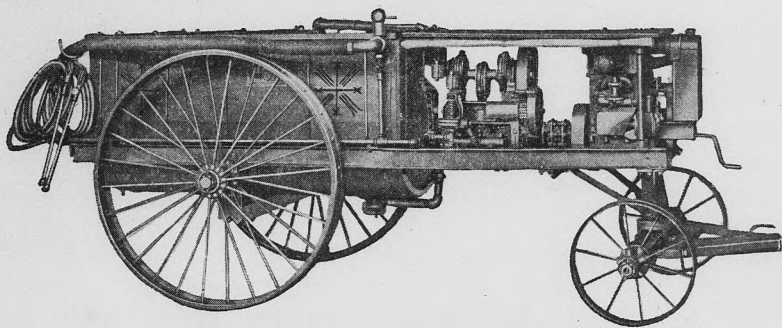


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FOREWORD

With this, the first issue of the "*Maryland Fruit Grower*", the officers of the Maryland State Horticultural Society are expressing their endeavor to improve upon the "Fruit Growers News Letter", formerly issued monthly to the members of the Society. It is the intention of the editors to include each month, one or more recent papers on timely orchard topics, delivered before the various Horticultural Societies of the United States. In this way, members of the Maryland State Horticultural Society will be kept in close contact with the latest thought and facts on the production and marketing of horticultural products. Besides the papers to be included, the "Fruit Grower" will continue the short items of general interest to growers, as was done in the "News Letter".

The patronage of our advertisers has enabled us to issue this printed publication. Be sure to read every advertisement, and remember these advertisers when you order equipment and materials for the coming year. Mention the "Maryland Fruit Grower" when you send them your order.

We hope that you will like the "Fruit Grower". Read it. Keep it. Show it to your friends. With the hope that you will help us to improve and that this publication will add to your enjoyment and knowledge, we dedicate it as our effort to promote better fruit growing everywhere.

What's This?

"Wisconsin Horticulture" quoting from "Fruits and Gardens", tells us that of 25,512 breakfasts served on the dining cars on a southwestern trunk line railroad during March 1929, 7,836 people ordered grape fruit, 6,009 preferred orange juice, 2,413 called for apples, and 1,588 ate prunes. Others ate figs, pineapple, strawberry or lemon, but 10,135 didn't even ask for fruit.

West Virginia Growers To Meet

Interesting meetings are scheduled at Inwood, West Virginia, on February 9, 10, 11, at which time a school for orchard foremen and growers will be held. Following this meeting the West Virginia Horticultural Society will open their annual two-day convention at Martinsburg, West Virginia, beginning on February 12. Programs may be obtained from Carroll R. Miller, Secretary, Martinsburg, West Virginia.

Maryland Spray Schedules

The 1931 Spray Schedules for Maryland will be sent to fruit growers during February. The new schedules contain no radical changes in materials or sprays applied, but the schedule will be greatly improved in form, with more complete directions and comments regarding materials, pests and diseases.

The Importance of Organic Matter In Orchardling

by
Dr. E. C. Auchter
Principal Horticulturist in Charge
U. S. Department of Agriculture

In order to have satisfactory fruit yields it is necessary to maintain good growth conditions in the orchard. Thus there should be a good yearly growth of fruit spurs, terminal growth, trunks, branches, and roots. To secure this good yearly growth, all practices of pruning, thinning, spraying, fertilizing, and soil management must be properly performed.

The lack of sufficient water (moisture) and nitrates are often the two big limiting factors in successful tree growth and fruit production in the United States. Of course we might enumerate several other factors which are also essential, but water and nitrates appear to be the most important in most cases.

Importance of Water! The great importance of water in tree growth and successful fruit growing cannot be over-emphasized. The absolute dependance of the tree's welfare on water can readily be seen from the fact that all soil foods must first be dissolved in water before they can be taken into the plant. These soil foods, however, do not flow into the plant in a water stream, but their intake depends upon their solubility and their relative concentration within and without the plant. Whenever their concentration is higher in the soil solution than in the plant they diffuse into the plant. If it were not for water these mineral foods would not be transported up through the plant. Water again is necessary in the formation of the carbohydrates, proteins, fats, etc., and their translocation down from the leaves to all parts of the branches, fruit, trunk, and roots. Large amounts of water are likewise transpired daily. Something like five hundred pounds of water are transpired for each pound of dry matter produced, and fruits contain from eighty-five to ninety per cent of water. Such troubles as cracking of fruit, water core, fruit pit, cork drought spot, and die back, are all exaggerated by improper watering relations. Mathematics show that each vigorous, mature apple tree will use from fifteen to twenty tons of water per year when it is making a good growth and is producing a good crop.

Importance of Nitrogen: Fertilizer experiments conducted in many different orchards of this country have uniformly shown the great value of nitrogen in peach and apple orchards. When quickly available nitrogen fertilizers are used, terminal growth, fruit spur growth, and branch and trunk growth are greatly increased. The leaves become larger, and greener, more fruit buds are formed and greater crops result.

Role of Organic Matter: The addition of organic matter to orchard soils either through growing heavier sods in the sod orchard, or by turning under heavy cover crops in the

cultivated orchard will influence greatly the water and nitrogen supply for fruit trees. In the handling of orchard soils, we need to conserve moisture, keep up a nitrogen supply, and keep a proper physical condition of the soil. The addition of large amounts of organic matter will greatly aid in doing all these things.

General farmers have realized for years the value and necessity of having organic matter turned under, but orchardists have not benefited by this experience, and in many regions in this country, have allowed the organic matter content of their soils to decrease to such an extent that many of the soils now puddle during rains, or the soils erode and wash badly during winter and bake and crack during summer.

Many of our orchard soils, because of a lack of organic matter, have gradually become unproductive. Fruit spur and terminal growth on the trees is short, the bark becomes tight, the fruit doesn't size up, much of the fruit cracks during summer when dry spells followed by rainy periods occur, die back or rosette appears on the terminals, more top and root injuries occur in winter, and in many cases the addition of nitrogen fertilizers gives very little response.

In such cases orchardists have pruned harder and thinned the fruit heavier in an attempt to keep up the size and quality of fruit. These practices, which have reduced the number of fruits, and total possible yield per tree, have simply allowed more water and nitrates for each of the fruits left, and of course have improved it to a degree.

It seems to me that such orchardists should immediately turn their attention to getting more organic matter in their soils. It is the only way to permanently improve the soils and prevent the occurrence of such troubles just outlined.

ADVANTAGES OF ORGANIC MATTER

From the moisture standpoint, I like to think of organic matter as a sponge in the soil. The hard, shaley, or clay soils are loosened up and made more porous, so that during rains, the water soaks in instead of running off, and is absorbed by the organic matter. Thus large amounts of water are held in the soil, and this is available for the trees gradually during the season. This is especially important in order to keep the fruits growing steadily and normally so that cracking will, to a large extent, be eliminated.

As the organic matter decays in the soil, nitrogen is of course liberated and becomes available for the trees. If leguminous cover crops have been used, the soil nitrogen content is considerably increased, while if non-legumes have been used, much of the nitrates, which might have leached away are taken up and held by the plant and thus returned to the soil. This means that it will probably be possible to apply smaller amounts of nitrogen carrying fertilizers per tree and get equally as good results.

When the organic matter decays, carbon dioxide is also given off into the soil. This results in a more acid soil solution and more of the plant foods already in the soil are dissolved and made available for the tree's use.

The addition of organic matter improves the physical condition of all soils. As a result they become better aerated and their bacterial content is increased. Such soils are warmer in winter and cooler in summer, and all conditions for tree growth are improved.

HOW TO IMPROVE THE ORGANIC CONTENT OF ORCHARD SOILS

Sod Orchards: If orchards are being grown in sod, and the sod is thin and poor, there will be very little organic matter to cut and thus add to the soil. A lime test should be made and lime added if the test shows that lime is needed for improving the growth of the sod. Whatever fertilizers are needed for improving the growth of the sod should be added. This may mean a high grade, complete fertilizer consisting of nitrogen, phosphorus and potassium. The important thing is to grow a heavy sod so that large amounts of organic matter can be cut twice a year and left on the ground to improve the soil.

Cultivated Orchards: In the case of cultivated orchards, the object should be to plow under heavy cover crops yearly. Select the cover crop which will do best under your conditions and make the most organic matter. If legume crops as soy beans, cowpeas, crimson clover, or vetch will thrive and produce large amounts of organic matter, they should be used because of the fact that the nitrogen of the air is fixed by the bacteria in the nodules and thus the nitrogen content of the soil is increased as well as the organic matter content. But remember that a large amount of organic matter is the important thing in order to improve the physical condition of the soil and especially its moisture holding capacity. As a result, if non-legumes as rye, buckwheat, sorghum, sudan grass, millett, or rape, and cowhorn turnips will produce more organic matter, they should be used. Additional nitrogen can easily and cheaply be added if this is found desirable, in the form of some quickly available nitrogen carrier. In many parts of this country a mixture of one bushel of rye and ten to fifteen pounds of winter vetch makes a very satisfactory cover crop.

As with the sod orchard, a lime test should be made and lime and fertilizer should be added, if these are necessary in order to produce a heavy cover crop. Nitrogen, phosphorus and potassium will probably all have to be added on many soils to get a heavy growth of cover crops.

Time of Sowing Cover Crops: Cover crops should be sown much earlier than has been the practice in many parts of the United States. If weather and soil conditions will permit, the crops should be seeded early enough in the summer so that practically all of their growth will be completed by fall, especially in the northern sections. However in the middle or southern sections of the country, certain crops will grow some during the winter thus increasing the bulk of organic matter. It would appear best, as a general rule, to have the cover crops plowed or disked under before tree growth begins

in the spring—otherwise they will compete with the trees for moisture, nitrates and other mineral nutrients.

It will be recalled that fruit spur growth for the year is completed about two weeks after blossoming, and that terminal growth is usually completed about July 15th. It can thus be seen how important it is that nothing competes with the trees early in the season if satisfactory growth is to be attained.

The first year that cover crops are sown earlier than usual (June 15th to July 1st) they may reduce the soil moisture content to such an extent, especially in a dry season as to affect the size of the developing fruit, but the following year and thereafter the soil moisture content should be so much higher because of the previously turned under organic matter, that the growth of the cover crops should not affect the growth of the fruit adversely except under some unusual drought conditions.

In some of the eastern fruit growing sections especially through the Shenandoah-Cumberland Valley region, the possibility of growing two cover crops each year is being given consideration by the growers. In such cases, after the orchard has been plowed or disked thoroughly, the cultivation is stopped about May 15, and such cover crops as soybeans, sudan grass, millet or cowpeas are seeded. These are allowed to grow until the middle of July when they are turned under and the ground cultivated until about Sept. 1st, when another cover crop such as rye, or rye and vetch is sown. This cover crop grows through the fall and early winter and is also turned under before growth of the trees start in the spring. This plan, together with others, is being investigated by different Experiment Stations and the Government. It emphasizes the importance placed upon organic matter by the growers in the east.

Several orchards in which the soil had become depleted and the trees stunted, have been reinvigorated in this country by increasing the organic matter content of the soil, together with fertilization. After turning under heavy crops for two seasons, many of the troubles resulting from insufficient moisture were corrected and the trees again responded well in growth and production to application of nitrogen fertilizers.

SUMMARY

In order to have satisfactory tree growth and the production of large crops of normally developed, high quality fruit, several essentials are necessary. Water and nitrates appear to be two of the most important and limiting factors, however, if these desirable conditions are to be attained.

The addition of large amounts of organic matter to our orchard soils will improve the physical condition of all soils, and less washing, puddling, and eroding of soils will occur; they will be better aerated, and their bacterial content and productive power will be increased.

Factors Influencing Yield, Size and Quality of Apples

J. R. Magness, Principal Pomologist, U. S. Dept. of Agriculture

The first requirement of successful orcharding is to get moderately good yields per acre. Unless the orchardist can get fairly heavy production it is probable that his orchard will prove unprofitable, regardless of the quality of fruit that he grows. Under most orchard conditions the most feasible way for the grower to reduce production costs is through increasing yield per acre. The average cost of growing an acre of apple up to harvest time in the State of Washington is very close to \$300, yet the cost per box or per bushel is probably less than it is in the State of Maine. With a total cost of approximately \$300 per acre the good orchards will produce more than 500 packed boxes per acre. Many orcharding costs are fixed, regardless of yield, so the most feasible way to reduce costs is generally through increasing production. High production per acre may reduce the quality of the fruit in certain cases, but generally high and regular production is associated with good quality fruit.

In order to determine the best methods of increasing production in the orchard it is necessary to study the functioning of the tree and how the fruit is formed on the tree. It is particularly important to understand the relation between the foliage on the tree and the production of the fruit.

The statement is often made that the leaf is the breathing organ of the tree. The leaf is much more than this. It is the place where food materials of the tree are manufactured almost exclusively. The raw materials taken in from the soil or from the air are of very little value to the plant until they have been rebuilt into more complex compounds in the leaves.

The leaf is of rather complex structure. On the under side of the leaf there are thousands of openings, or pores, which allow a fairly free passage of air into the leaf. These pores are open only a certain portion of the day. Generally, they are open when there is an abundance of moisture in the leaf and whenever it is light. These two factors, moisture and light, are necessary to keep these pores open. They close at night and also close at any time during the day when there is a slight lowering of the moisture content of the leaf.

When these pores stand open the carbon dioxide which is present in the air in very small quantities passes into the leaf freely through the openings. In the leaf this carbon dioxide comes into contact with the water which is brought up through the roots and trunk. These substances in the presence of light and the green coloring matter, or chlorophyll, of the leaf are combined to form sugars. From these sugars practically all of the compounds which go to make up the fruit and the plant are built.

It can readily be seen that the total amount of sugar that is formed is very largely dependent upon the amount of foliage present in the tree. Generally, the amount of sugar

formed is determined by the amount of carbon dioxide which enters the leaf. If you double the leaf area in the tree you approximately double the carbon dioxide entering the leaves and the total sugar and other food materials which can be formed. We often think of the roots as the feeding organs of the tree and we think of the food material as coming from the ground. The food materials that go to make up the fruit, however, do not come from the ground to any extent, but come from the materials that are formed in the leaves. An apple is approximately 85 per cent water and the other 15 per cent is almost entirely products formed in the leaves.

Basically, the amount of fruit that a tree can grow in a year will depend on the amount of foliage on that tree. Consequently, if we are going to increase production per tree and per acre, first of all we must increase the amount of foliage per tree or per acre. Also, we must have enough moisture to keep that foliage working. When the leaves get dry the pores close down and the leaves stop work.

FOLIAGE NECESSARY TO BUILD AN APPLE

For several years tests have been carried on to determine just how many leaves are required to form the materials which go into a good sized apple. We have been very much surprised to find that with most varieties around 40 leaves per fruit are necessary to get the best commercial size. 40 well developed leaves are apparently necessary to form the materials which go into the fruit and to form a sufficient amount of food material to develop fruit buds for the year following. If the leaf area is less per fruit the size of the fruit is decreased almost in proportion. For example, with 10 leaves per fruit delicious apples would usually pack around 210 per bushel, this being smaller than commercial size. With 20 leaves, fruit packing around 150 per bushel would be secured; with 30 leaves, fruit packing around 113 per bushel. Doubling the leaf surface per fruit does not result in fruit being twice as large, but does result in larger and better fruit, until from 40 to 50 leaves per apple are available. Any thinning which we do is likely to decrease the total number of bushels and boxes which we take off the tree, but it increases the size, sugar content, and quality of the individual apples.

The leaf area present in a tree is largely determined within the first month of the growing season. By the time the fruit has set and become $\frac{1}{2}$ inch in diameter leaf area for the season is fixed. If there are too many fruits on the tree in proportion to the leaf area nothing can be done to increase leaf area after this date. The only way to affect the proportion of leaves to fruit is through thinning to reduce the number of fruits, leaving the leaf surface constant.

A considerable part of the food material formed in the leaves must, of necessity, go to the building of the roots, trunk, and branches of the tree. We do not know just how much of the food materials are used up in tree growth, but probably about $\frac{1}{3}$ of the total material formed in the leaves of the ordinary apple tree are used in this way, while the other

2/3 go to build the fruit. After the fruit is set it apparently gets first call on the food material in the leaves. With a heavy set of fruit there is relatively little growth of wood and relatively little storage of food materials for the next year during the remainder of the season. Consequently, following a very heavy crop the trees have little food stored in them. They are more subject to winter injury and are less likely to product fruit the following season.

INCREASING THE FOLIAGE

There is only one way, so far as I know, that you can increase the amount of foliage on your trees, and that is through increasing growth. The more growth you get in the tree, the greater the leaf area that tree carries. If you have a spur making $\frac{1}{4}$ inch growth it will have three or four medium to small size leaves. If it is making $\frac{1}{2}$ inch growth it will have more and larger leaves. If it is making $\frac{3}{4}$ to one inch growth it will have several large leaves formed on it. Similarly with the terminals; the greater the amount of growth that they make, the greater the area and the larger the size of the leaves. Consequently, as a basic consideration to increasing the yield it is necessary to increase leaf area by increasing growth. Under eastern conditions and on trees in full production we can pretty nearly say that the more growth, the better, so far as fruit production is concerned. In the Northwest we consider that an orchard is not in maximum production unless it is making from 10 to 16 inches of terminal growth per season.

INFLUENCING GROWTH IN ORCHARDS

A survey of orchard conditions all over the United States will indicate clearly that there are two factors which appear to be absolutely essential to the maintenance of good growth conditions in orchards. First of these is the building up and maintenance of organic matter in the soil. The second, provision for adequate nitrogen supply in the soil. There is not time to discuss these two factors in detail in this talk. If there has been any single thing which experimental work on orchard soil management during the past five to ten years has emphasized it is the importance of the organic matter content of the soil. Fifteen years ago the apple orchards of the Pacific Northwest were dropping down in productiveness, largely as a result of exhaustion of organic matter in the soil. About that time planting of alfalfa in the orchards began. This alfalfa is not cut and removed from the orchard but is disced into the soil once a year, either in the fall or spring. During the summer it grows and mats down under the trees. In most of the orchards nitrogen is applied in addition to that furnished by the alfalfa. Under this system of soil management production has increased steadily during the past fifteen years.

Similarly, under eastern conditions the value of the organic matter content of the soil has been demonstrated during recent years. In the Shenandoah and Cumberland valleys every effort is being made to build up organic matter in the soil by the more progressive orchardists. In some cases

crops grown outside the orchard are being hauled to the orchard and worked into the soil to increase organic matter.

Along with the organic matter content of the soil an ample nitrogen supply is essential to growth. Organic matter and nitrogen go together in the soil. Recent work has shown that it is almost impossible to maintain an adequate nitrogen supply in the soil unless organic matter is also present. There apparently is a fairly definite ratio between organic matter and nitrogen present in any soil.

A third way of influencing growth in trees is through pruning. Pruning tends directly to reduce the number of buds and growing points but stimulates greater growth on those which remain. The total effect of pruning is likely to be some reduction in leaf area per tree but a greater amount of leaf area per spur or per shoot. Consequently, while pruning may reduce the number of blossoms formed, and thus the total number of fruits on the tree, it generally results in greater leaf area per fruit that is left and better size in the individual fruits.

FACTORS AFFECTING COLOR OF FRUIT

There are two outstanding factors which appear to affect the development of red color in apples. These are, first, the sugar content in the fruit and second, the exposure of the fruit to light.

High sugar content in the fruit can be secured in two or three different ways. If the orchard is grown with a shortage of nitrogen the fruit is likely to develop high sugar content and high color. Under these conditions, however, the fruit will usually be small and the yield per tree very light.

Sugar content can also be directly influenced by amount of foliage present per fruit. The greater the amount of foliage present per fruit the higher the sugar content of that fruit is likely to be. Consequently, thinning fruit to increase the foliage for each fruit left in one very practical orchard method of increasing color in the fruit. Thinning experiments in different sections have demonstrated clearly that the fruit on thinned trees develops better color than fruit on heavily loaded trees which is not thinned.

The amount of sunshine is beyond the control of the orchardist. By pruning the trees sufficiently to open them up and admit light it is possible, however, to increase rather markedly the amount of color of the fruit.

Recent work has demonstrated that the ultra violet light in sunlight is the portion of the spectrum most important in developing a red color in apples. Ultra violet light is readily screened out of sunlight during cloudy weather. On the other hand, it reaches its maximum during very clear days and after rains have washed the dust from the air. It is also at its maximum at high elevations. The fact that ultra violet light appears to determine color development probably explains many of the observed effects of weather on color development in apples.

Practically, the orchard operations which are most important in securing color development are fruit thinning and

pruning to open up the trees reasonably well. Excessive nitrogen fertilizers generally tend to reduce color. On the other hand, no fertilizer treatment which can be applied, will, so far as we know, directly increase color development in apples.

To summarize the factors influencing yield, quality, and size of apples we can say that, first of all, possible yield is almost directly determined by the amount of foliage per tree, which in turn is largely determined by the amount of growth which the tree is making. To increase orchard yield, increased growth is necessary. The size and quality of the individual apples are determined to a large extent by the foliage upon which they are able to draw for their good materials. Under orchard conditions this can be influenced directly by fruit thinning which also is the most effective orchard practice in increasing color.

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- 6—Gives fruit a better finish.
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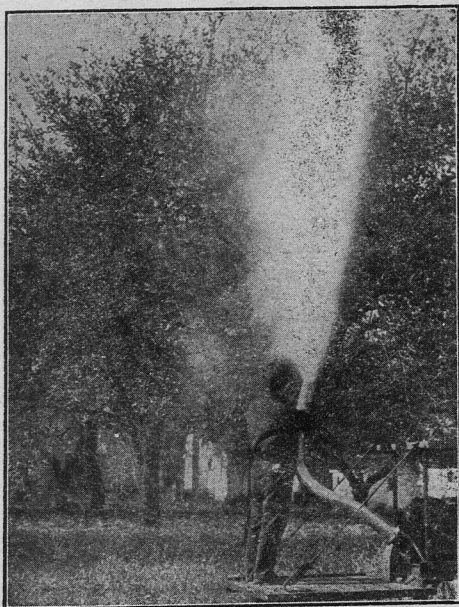
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174 E. Long Street, Columbus, Ohio



Do you Spray?

Do you Spray and Dust?

Do you Dust?

These subjects are discussed
in a little booklet that we
will send you upon request.

Whether you spray or dust, Niagara can furnish you with the most up-to-date equipment and materials. Before you decide definitely what you will use next season, it will pay you well to get the whole story, first hand on Niagara Bentonite-Sulfur dusts and sprays—Kolodusts and Kolosprays.



Niagara Sprayer and Chemical Co., Inc.
MIDDLEPORT, N. Y.